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Executive Summary

Title: Beyond the Space Cadre

Author: Major Brad Phillips, United States Marine Corps

Thesis: The Marine Corps must develop an expeditionary trained and equipped core of space professionals, beyond the status quo, who can provide the commander with integrated space analysis, products, and expertise during the Marine Corps Planning Process (MCPPE), as well as synchronize and provide existing and emerging space support products for the supported commanders.

Discussion: This report studies how reliant the U.S. military has become on space technologies and makes recommendations on how the Marine Corps should advance to leverage space assets. For the past five decades, the U.S. has maintained an advantage in space; however, our adversaries are attempting to gain the asymmetrical advantage by taking away our space superiority. The U.S. recognizes that space activities have improved life around the world, enhancing security, protecting lives and the environment, speeding information flow, and serving as an engine for economic growth. To that end, the U.S., Department of Defense, Joint Chiefs of Staff, U.S. Marine Corps, as well as the other services have enacted numerous policies and programs to leverage the use of space-based technologies. This report will draw on these policies and programs already in place, and will take a critical look at the Marine Corps current space operations programs and policies concerning personnel, training, and equipment.

Conclusion: The Marine Corps has made great strides in developing a space cadre. However, the Marine Corps must develop a core of space professionals who are equipped, trained, and task organized to deploy with and support the Marine Corps Operating Forces with the planning, execution, and understanding of space operations.

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THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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Preface

In 2004, I completed a joint tour at Cheyenne Mountain Air Force Station, Colorado Springs, Colorado. During that time, I was exposed to a number of tools that the U.S. military has in its tool chest that enable the warfighter to complete his mission. I have come to realize that the U.S., commercially and governmentally, has become reliant on space-based capabilities and this reliance has left it vulnerable. The U.S. can no longer assume that we will always have uninterrupted access to our space systems. The Marine Corps as a user of space systems for navigation, communications, intelligence, weather, missile warning, has a stake in space operations, because without access to the space assets previously mentioned, the Marine Corps' ability to operate would be severely hampered. This report analyzes the U.S. Army and Marine Corps advancements in space operations and outlines how the Marine Corps should progress beyond the status quo to best support the Marine Corps Operating Forces.

I would like to acknowledge Dr. Swanson of Marine Corps Command and Staff College for his editorial guidance and recommendations that enabled me in the development of this report. Additionally, I would like to thank Dr. Scanlon and Ms. Hamlen from the Leadership Communication Skills Center at Marine Corps University for their objective viewpoints and recommendations. Finally, I would like to thank my family for their unfettered support, in particular, my wife Lori, whose unvarnished input was of great value.

Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after changes occur.

--Giulio Douhet

Ever since the Soviet Union successfully launched Sputnik on October 4, 1957, the world has changed. Sputnik, a beach ball sized metal satellite, orbited the earth on an elliptical path and was a single space event that did little more than let out radio frequency beeps. However, it marked the beginning of the space age and the space race between the Soviet Union and United States. Fifty years later, space activities have enhanced life around the world, increasing “security, protecting lives and the environment, speeding information flow, serving as an engine for economic growth, and revolutionizing the way people view their place in the world and the cosmos.”¹ Since 1957, a vast number of countries, businesses, and consortias have become dependent on space-based technologies to facilitate mission accomplishment—including the U.S. military.

The U.S. military’s reliance on space-based capabilities is viewed by its adversaries as a vulnerability.² This exponential increase in demand and dependency on space-based programs leaves the U.S. military, in particular the Marine Corps, at a crossroads. The Marine Corps can either rely on the other military and government services to provide space expertise, or it can develop a core of its own space professionals that can integrate it into combined combat operations against its adversaries who seek to exploit the U.S. military’s vulnerability in space.

This report will argue that the Marine Corps must develop an expeditionary trained and equipped core of space professionals, beyond the status quo, who can provide the commander with integrated space analysis, products, and expertise during the Marine Corps Planning Process (MCP), as well as synchronize and provide existing and emerging space support products for

the supported commanders. To best support its operational forces the Marine Corps must make a significant investment in space operations that will affect current Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF).

Space a Unique Warfare Medium

Before the airplane, the U.S. military understood the import medium of air and its fundamental qualities that it could exploit during war. During the Civil War, the Union Army used hydrogen balloons for aerial reconnaissance and telegraphy. The balloons were effective not only in locating Confederate Army movement, but also in forcing the Confederate Army to conceal its forces. To avoid detection from the balloons, the Confederate Army altered its tactics. The Confederates blacked out their camps after dark, created dummy encampments and gun emplacements, all of which took valuable time and personnel.³ Fast forward to 1999, when the U.S. used spaced based reconnaissance platforms to target Serbian defense systems. The Serbians did an excellent job of employing fake tanks and air defense assets; however, the building of the decoys took valuable time and personnel.

Maintaining control of the high ground has been of the utmost importance for militaries throughout the ages. Space is the “ultimate high ground” and to maintain the high ground requires space operations experts. Giulio Douhet, a pioneer in air power theory, stated “only airmen can fully appreciate airpower’s intricacies: therefore, only airmen should command air forces.”⁴ The same reasoning can be applied to space operations in that only space operations experts should command space.

Giulio Douhet, John Boyd, William Mitchell, James Doolittle, and others have provided air power theories that have dramatically shaped the modern battlefield. Many of the air power theorists’ concepts are applicable to space. Merely applying air power theory to space, however,

is overly simplistic and done in error. Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, clearly states, "Space is a medium of warfare like air, land, and sea."⁵ Each medium is unique and the limitations that apply to ground forces are not the same for air and naval forces. Therefore, it is logical to assume that space is a unique warfare medium that requires a core of highly trained Marines who are experts in space operations and understand the distinct theory, doctrine, and policy of space.

Space Threats and Our Increased Dependency on Space

The Marine Corps, like the other services, has become extremely reliant on space-based technologies for navigation, command, control, communications, intelligence, and munitions employment. For example, the number of Global Positioning System (GPS) Precision guided munitions (PGM) used in Operation DESERT STORM was 8 percent compared to 68 percent in Operation IRAQI FREEDOM (OIF).⁶ U.S. reliance on satellite communications (SATCOM) is already enormous and increasing at a dramatic rate. For example, during Operation DESERT STORM, SATCOM accounted for one megabyte per second (Mbps) per every 5,000 troops deployed compared to OIF where the number swelled to 51.1 Mbps.⁷ The United States' potential adversaries are aware of its reliance on space-based systems and continuously seek means to take away its space dominance. For example, China launched a direct-ascent Anti-Satellite (ASAT) on January 11, 2007, which struck a Chinese FY-1 weather satellite in low Earth orbit (LEO).⁸ The Chinese, along with other countries, continuously conduct research and development into ASATs, radio frequency (RF) jammers, ground based lasers, and other threat technologies, that are oriented at denying U.S. forces access to space-based systems. Nation

states are not the only entities that are making investments in space technologies. The private sector also has a stake in space technology.

The National Defense Industrial Association (NDIA) predicts by 2010, 70 percent of all satellites will be owned and operated by private companies—a dramatic increase from the 30 percent of 1996.⁹ The U.S military has become increasingly dependent on commercial satellite communications during military operations, because the cost of fielding its own independent space-based communication systems costs too much and the demand outstrips the Department of Defense capabilities. During the initial phases of Operation Iraqi Freedom, coalition forces used Inmarsat, a London-based mobile satellite communication company. Inmarsat reported its busiest month in its history during the peak of the war in March, April, and May 2003.¹⁰ Additionally, Inmarsat, as a commercial provider of communications was not capable of providing coalition forces with “encrypted data transmission at 128 Kilobytes per second (kps) but only at 64 kps - a speed far too slow for the military.”¹¹ Potential adversaries see the Department of Defense’s increased reliance on commercial and government satellite systems as a vulnerability that can be exploited.

Current Policies and Employment of Space Forces

National

In August of 2006, President George W. Bush signed the U.S. National Space Policy, which outlines the United States’ principles, goals, and guidelines for its national security. There are two important items from this document that link military space operations to national security:

- Develop and deploy space capabilities that sustain U.S. advantage and support defense and intelligence transformation; and

- Employ appropriate planning, programming, and budgeting activities, organizational arrangements, and strategies that result in an operational force structure and optimized space capabilities that support the national and homeland security¹²

In order to achieve the two objectives listed above from the National Space Strategy, the U.S. military must maintain its capabilities to execute the space support, force enhancement, space control, and force application missions. Additionally, the National Policy directs the military to establish standards and implement activities that develop and “maintain highly skilled, experienced, and motivated space professionals within their workforce.”¹³

Department of Defense

In understanding that space is a medium like the land, sea, and air within which the military conducts activities to achieve U.S. national security objectives, the Department of Defense published Department of Defense Directive (DoDD) 3310.10 in July of 1999. DoDD 3310.10 directed that space capabilities and applications shall be integrated into the “strategy, doctrine, concepts of operations, education, training, exercises, and operations and contingency plans of U.S. military forces.”¹⁴ Additionally, the directive requires that space support be included at the lowest tactical level and be emphasized and optimized to ensure that all echelons of command understand and exploit fully the operational advantages that space systems provide, understand their operational limitations, and effectively use space capabilities for joint and combined operations.¹⁵

Also important is Joint Publication 3-14 which states, “[E]ach service is responsible to develop and maintain a cadre of space expertise.”¹⁶ DoDD 3310.10, as well as Joint Publication 3-14, provides the services with guidance on how the DoD must transform and be prepared to fully integrate space capabilities to ensure the United States has the space power to achieve its national security objectives.

When comparing the services and how they have advanced in space operations and adhere to national policy and DoD policies and directives this study will focus on the Army and Marine Corps. The Army and the Marine Corps missions, focus, and ethos are more similar in nature than the Air Force and Navy therefore, this study will exclude the Navy and Air Force. Elaborating, the Army and the Marine Corps are primarily land maneuver forces with support and focus to the warfighter on the ground.

Army

In 1994, realizing that space assets are a significant force multiplier, then Army Space (ARSPACE) assumed a new mission of Contingency Operations (Space).¹⁷ The Army also understood that space-based assets are an inherent critical vulnerability. Today, the Army continues to support this space operations mission by providing operational forces with Army Space Support Teams (ARSSTs). The ARSSTs deploy to provide worldwide space operations support to Army forces during operations.

The ARSSTs augment corps and division space expertise and they are normally assigned to the G3 section, during exercises, contingency operations, and combat operations. The ARSSTs primary support is at the operational and tactical levels. ARSSTs may be assigned to support other levels in Army or non-Army units. Some of the ARSSTs key capabilities are:

- Provide tailored, task organized space resources to assist the supported command in the areas of SATCOM, Position Velocity and Timing (PVT), environmental monitoring, ISR, missile warning, and other theater-tailored space information.
- Provide space expertise with an in-depth understanding of red, gray, and blue space orders of battle, the operational capabilities and threats imposed, and implications for land force operations.
- Support the space contribution to the IPB process.

- Provide space operations assessments and information to the G2, G3, G6, and other staff sections as appropriate. They, in turn, provide final staff assessments and determine impacts on communications, operations, and intelligence.
- Assist the supported command in space control planning/understanding.
- Integrate space into operations through participation in the military decision making process by developing the space operations annex and providing current space-related information.
- Synchronize space support and threat information in the unit execution matrix.¹⁸

The ARSST is a task organized team that is tailored to the needs of the supported commander based on mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC). Task organization is a key component to Marine Corps expeditionary organization and the ARSST organization fits into the Marine Corps' task organizational model. ARSSTs are task organized like the Marine Air-Ground Task Force (MAGTF) and can be tailored to each mission to provide a solid team of space experts. The team provides expertise on Army space issues and is aware of the latest national, civil, commercial, and DoD's space system capabilities, including user equipment and combatant commander and Army initiatives.¹⁹ A full ARSST has a very small footprint of organic equipment that it requires to conduct its mission. The full suite of equipment and team is self contained and transportable in two single high mobility multipurpose-wheeled vehicles (HMMWV). Appendix A provides the high-end equipment density list of gear and typical team composition. In addition, the ARSST is a responsive and efficient package that is agile and easily sustainable. The Army designed the ARSST in order to maximize benefits of space capabilities to the "warfighter while minimizing the overhead investment required of the supported unit."²⁰

The ARSST conducts its reach back, space analysis, and production of space products around the ARSST-Tactical Set (TS). The ARSST-TS has four Space Operations System (SOS) workstations and a robust high-bandwidth secure satellite communications capability. Each SOS workstation includes a suite of software applications that provides reach back capability, space analysis tools and a limited capability to produce space-related products.²¹ The ARSST-TS used by its highly trained team has provided commanders with valuable space operations products. The system and ARSST have demonstrated repeatedly its usefulness during employments in operations other than war, including humanitarian assistance operations, disaster relief operations, Operation ENDURING FREEDOM (OEF), OIF, and other contingencies.²²

The Marine Corps has taken advantage of the ARSST capabilities. During OIF, I Marine Expeditionary Force (MEF) on the march to Baghdad had an ARSST attached that provided the MEF with Satellite Reconnaissance Advance Notice (SATRAN) capabilities. The ARSST assigned to the MEF was able to inform the commander when an enemy or other country's reconnaissance satellites were capable of seeing ground activity in their area. The ARSST was also able to provide the MEF with satellite vulnerability (SATVUL) times, which notified the commander when there were threats to U.S. satellites. When employing PGMs SATVUL capability becomes critical for targeting. Additionally, the ARSST provided the Marine engineers with imagery of bridging and river crossing sites.²³

The ARSST is effective because it utilizes advanced equipment; however, the ARSST would not be what it is without the Functional Area 40 (FA 40) soldier who leads the team. The FA 40 is the Army's primary contribution to the space cadre. The FA 40 provides the commander with expertise and guidance on conducting the space operations, which enhances a command's ability to "task, collect, process and act on space-based products, information, warnings, and space-

related capabilities.”²⁴ Additionally, when the FA 40 is not in a tactical billet he or she formulates policy, develops concepts, assists in the development of technologies, evaluates, and implements the tactics, techniques, and procedures for the operation and use of space. The FA 40 is able to complete these tasks, because he receives formal training before filling an FA 40 billet.

In order to be designated an FA 40, the Army officer must complete the eleven week Army Space Operations Officer Qualification Course (SOOQC) conducted by U.S. Army Space and Missile Defense Command/Army Forces U.S. Strategic Command (USASMDC/ARSTRAT) Directorate of Combat Development in Colorado Springs, Colorado. The focus of SOOQC is for the officer to understand the capabilities of space-based systems that provide support to military operations, and to develop essential skills required to plan and conduct Space Operations, which support Army, Combined and Joint war fighting.²⁵ Officers that are designated FA 40s are then tracked and monitored by the Army’s Human Resource Command to ensure that they follow a career path that keeps them sharp in their functional area and competitive for promotion.

Typically, an FA 40 comes from one of the branches within the Army (infantry, logistics, armor, etc.). The distinction between functional areas and branches in the Army is that the functional areas are personnel grouped together by the Army based on a technical specialty or expertise. Once designated as an FA 40 the Army officer is not assigned a new primary MOS. However, the officer’s career progression, future assignments, and professional education fall under the umbrella of the FA 40 human resource monitor not his primary MOS monitor. Designating someone as an FA 40 indicates that a significant initial investment into education and training was required. The Functional Area 40 designation also identifies the need for

continued higher-level education, training, and experience to maintain a level of proficiency that is relevant to the warfighter.

FA 40s are usually field grade officers and are assigned as a principle space operations staff officer at the corps level. An FA 40 can also expect assignments to an Army Space Support Elements (SSE), space operations staff officer at major army commands, or as an ARSST team leader, as mentioned early in the report. The FA 40 can serve as a space operations instructor or serve on a joint staff as a space operations officer.

Marine Corps

The Marine Corps has four separately related programs that it relies on to provide commanders with space experts and to ensure that space capabilities are utilized and integrated into the mission. The first is the Marine Corps Technical Exploitation of National Capabilities (TENCAP) program. TENCAP is an intelligence driven initiative that is coordinated by the Marine Corps' intelligence community to lead the integration of current and emerging national system capabilities into the tactical decision making process.²⁶ The key point to TENCAP is that its primary focus is the implementation of current and future programs, not just space-based, intelligence programs.

The second program is Military Exploitation of Reconnaissance and Intelligence Technology (MERIT). MERIT is designed to develop and prototype capabilities to provide more "timely, higher quality intelligence to the warfighter and to improve the warfighter's ability to exploit that information."²⁷ TENCAP and MERIT are national level programs funded primarily on research, development, test and evaluation (RDT&E) programs for the Marine Corps operating forces. These programs have brought the Marine Corps numerous capabilities that the operational forces currently use in Iraq and Afghanistan. The

Intelligence Department, Intelligence Plans and Policy (IPP) Branch of Headquarters Marine Corps has the lead for TENCAP and MERIT and has focused these programs primarily on intelligence support for the operational forces.

The third program that the Marine Corps has to support space operations is its education program through the Naval Post Graduate School (NPS) in Monterey, California. At NPS Marine officers, first lieutenant through major, can attend a resident-level program and receive a Master's degree in Space Systems Operations. Space Systems Operations curriculum at NPS is part of the Information Superiority (IS) curricula, which encompasses the following degree tracks: Computer Sciences, Joint Command, Control, Communications, Computers, and Intelligence (C4I) Systems, Information Systems and Technology, Information Warfare, Intelligence Information Management, Modeling, Virtual Environments and Simulation, and Space Systems Operations.²⁸ The officers who attend the school graduate with a graduate-level understanding of space operations, tasking and employment of space surveillance, communications, navigation and atmospheric/oceanographic/environmental sensing systems as well as payload design and integration—specifically for the exploitation of Space and Information products.²⁹

The Marine Corps awards the graduates of this program with an Additional Military Occupational Specialty (AMOS) of 8866—a skill designation only. The skill designator simply identifies that a Marine has completed a prerequisite level of training and/or has experience that makes the Marine a unique asset to the Marine Corps. The Additional MOS is different from a primary or secondary MOS. The Primary MOS is a Marine's principal job and a secondary MOS denotes a special skill or training that the Marine holds in addition to his primary MOS that was obtained from a Marine Corps approved primary MOS producing school. Conversely, a

Marine that holds an AMOS has a skill designation that does not necessarily relate to any specific Marine Corps Primary MOS category. Currently the Marine Corps does not have long-term branch plans for career development for Marines with the 8866 AMOS.

A typical assignment for a Space Systems Operations Marine officer upon graduation from NPS is to Headquarters Marine Corps (HQMC) or Joint Staff to assist in the “designing, developing, and managing the acquisition of space communications, navigation, surveillance, electronic warfare, and environmental sensing systems.”³⁰ The assignment to HQMC or a Joint Staff, also known as the “payback tour,” is a three-year assignment in which the 8866 Marine works in a billet related to the NPS field of study. Once the payback tour is complete, the Marine Corps then reassigns the 8866 back to his primary MOS with the potential for follow-on tours. However, additional tours in space operations should not prohibit the career development of the Marine officer in his or her primary MOS.

The fourth program that the Marine Corps has to introduce to integrate its space capabilities into the joint operational forces is the space cadre program. The space cadre was established in December of 2003 for the purposes of:

- Identifying officers with space operations training and experience; and
- Identify billets in which space operations training and expertise is needed³¹

The cadre of space operations staff officers are awarded the AMOS of 0540 and are tracked by Info Operations and Space Integration Branch (PLI), Headquarters Marine Corps. PLI is not involved with manpower management and does not manage, assign, or identify Marine Corps Space Operations Staff Officers to serve in space operations billets. The Guidance published in Marine Admin (MARADMIN) 273/03 states that Marines with the 0540 AMOS will “continue to serve in their primary MOS with possible recurring tours in space operations.”³² The Marine

Corps has been assertive and has taken steps in the right direction by identifying Marines with space operations experience. Space officers with training and education in space operations provide the operating force commanders and supporting agencies with space system trained officers who can assist in planning and integrating space capabilities and needs into the Marine Corps operational plans and requirements.

In 2005, the Marines Corps additionally identified five strategic objectives for the space cadre program to Subcommittee of Strategic Forces of the House Armed Service Committee:

- To support the vision and goals of *Marine Corps Strategy 21* by creating a cadre of Marines who understand both the capabilities of the MAGTF and the unique advantages to be gained by fully exploiting current and future space-based systems.
- Increase the integration of current and future space-based capabilities to support the Marine Corps' Expeditionary Maneuver Warfare capstone.
- To shape the development of future space systems to meet Marine Corps warfighting needs through increased collaboration with all NSS partners.
- To increase the effectiveness of our operating forces through effective planning, integration, and coordination of space-based capabilities and assigned space forces.
- To increase the distribution of Marines with space training and experience not only throughout the NSS community, but also, more importantly, throughout the operating forces to inject space-knowledge at the individual unit level.³³

The Marine Corps understands the importance of space operations as identified by its aggressive engagement in TENCAP, MERIT, Space Operations Systems Officers AMOS, and Space Cadre programs. The Marine Corps' proclamation is that its space cadre is its "principle investment in space, and it is this group of personnel who will make space capabilities operationally relevant to the Marine Corps."³⁴ Developing a space cadre that understands how the MAGTF operates, as indicated in the first bullet above, and has a requisite knowledge base requires a weighty commitment from the Marine Corps.

During OIF, the Commanding General (CG) I MEF FWD identified space as a critical combat support enabler for MAGTF operations and requested increased permanent presence to the Joint Force Component Commander for the ARSST.³⁵ The Marines' efforts in identifying billets for space cadre members, determining the skills and training required as a space cadres member, and recognizing that MEF commanders do understand the importance of space, are all a critical mark in history for the Marine Corps and the space profession. The strides the Marine Corps has taken in space operations have been beneficial but are insufficient for future conflicts. Much more can and should be done to ensure that the Marine Corps is prepared to support *Strategy 21* and *Joint Vision 2020*. The Marine Corps must focus its space capabilities and needs, so it can most effectively support the Navy-Marine Corps warfighting team and its expeditionary mission. The Marine Corps must leverage its initiatives and make better progress toward a synchronized and integrated space operations program led by highly trained space professionals who are equipped to support the Fleet Marine Forces.

The Future for Marine Corps Space Operations

The Marine Corps, unlike the other services, has limited programmatic and fiscal investment in space. Yet the Marine Corps' operational investments in space for military advantages are at least equal to those of the other services.³⁶ In 2005, Brigadier General Thomas A. Benes, then Director of Strategy and Plans Division, Plans Policies and Operations, Headquarter United States Marine Corps, reported to a Sub-House Committee of the House Armed Forces Committee regarding the future of Marine Corps' space operations programs. General Benes stated, "The Marine Corps recognizes the importance of national security space to

our core competencies.”³⁷ General Benes continued to lay out four points that highlight the Marine Corps’ involvement in future space systems acquisitions and operations:

- Develop sound Concepts of Operation (CONOPs) for space that enhance the Marine Corps ability to integrate organic capabilities of the MAGTF into the joint force and improve the ability of Marine forces to operate globally across the spectrum of conflict.
- Support the executive agent for Space in its efforts to achieve excellence in acquisition. Marines will continue to participate in the development of the National Security Space Acquisition Policy 03-01. In addition, Marines provide the executive agent for space a user’s perspective in the assessment of key space programs.
- The Marine Corps remains actively engaged in the development of ongoing and innovative solutions to pioneer new methods for leveraging the advantages offered by space systems in support of the tactical warfighter in the joint force.
- Finally, the Marine Corps continues to invest in TENCAP in order to develop innovative solutions to meet the current and emerging operational requirements of Marine forces.³⁸

The Marine Corps’ dedication and focus towards space operations is heading in the right direction, however, its efforts fall short of the investments made by the other services. The Marine Corps must make a concerted effort to take its disparate space Command, Control, Communication, Computers, and Intelligence (C4I) systems and to synergize these equities around a core of space professionals. Collectively, space professionals with deployable ground based space C4I systems, can fully integrate for the commander, space capabilities and operations into planning and execution of all phases of the operation. Marine Corps space professionals with advanced support equipment will become the Fleet Marine Forces’ lead for maximizing space related capabilities to operate as part of the full spectrum Joint and interagency team to achieve the warfighters’ objectives. The Marine Corps understands that it cannot leverage the advantage of space operations alone. It must be forward leaning and work through its service component to USSTRATCOM, Marine Forces U.S. Strategic Command (MARFORSTRAT), and develop CONOPS and Tactics, Techniques, and Procedures (TTP) that

limit “stove piping” and facilitate the Marine Corps ability to support the joint force. In order to achieve this excellence, this study proposes three recommendations with respect to personnel, education, and equipment.

Personnel

First, the Marine Corps acknowledges the importance of its space cadre, however, if the connotation of a cadre is to form, train, or lead a skilled work force, then it is important to ensure that the space cadre remains skilled in order to achieve its aim. In order to maintain a skilled cadre of space operations officers, the Marine Corps must make the 0540 and 8866 AMOSs primary MOSs. The need for space-literate personnel who can provide enhanced access to space-derived information from the full range of military, national, civil, and commercial space segments is critical for the Marine Corps to be fully integrated into the Joint/Interagency Space Team.³⁹

With space technology rapidly evolving, it is important to ensure that the Marine Corps’ space cadre remains current with advancements in space technology. Equally important is to have a space cadre that knows the Blue, Red, and Gray space order of battles and can effectively provide the commander with current and accurate information regarding the vertical battlefield. Rather than simply track a cadre of space professionals in PLI, Manpower Management at HQMC must take over the management of the space cadre to ensure that Marines with space training, education, and experience are assigned to space related billets so that they remain current in their field. Merely tracking the 0504 and 8866 personnel with the AMOS space designator with no guarantee of a follow on tour in a space billet is not the best way for the Marine Corps to leverage its space trained personnel and to ensure it has a true space cadre.

Since space officers will be involved in high level staff planning and execution it is important that the Marine Corps field the primary space MOS with not only highly qualified officers, but also officers with the appropriate rank. Marine field grade officers, major through colonel, with previous space operations experience are the primary pool for consideration. Field grade officers could apply for a lateral move to space operations and make it a primary MOS. The complex nature of space operations and tying space operations into all the warfighting functions is why only field grade officers should be allowed to attain a space operations primary MOS. These officers should be board selected and have requisite education, training, and experience in the space operations field. Officers and enlisted not in the grade of major through colonel should be given the opportunity to obtain the AMOSs that are currently being used by the Marine Corps with all current policies and procedures remaining in place. It is important for the Marine Corps to continue to identify its highly skilled space operations personnel and award them the additional MOSs. However, the status quo is not good enough and does not guarantee the Marine Corps a core of professional space operations officers who know how the MAGTF works, while at the same time fully understanding the relationship of the MAGTF to space operations.

Professional Military Education

In order for the Marine Corps to ensure that it has the best-trained personnel, it must find an education source that will train its space operations officers to the Marine Corps' standards. There are three space operations MOS producing schools currently within the DoD that would suit the Marine Corps' needs to train its space operations officers. The potential schools are NPS and the Army's SOOQC, both previously mentioned in this study, and the National Security Space Institute (NSSI). The Marine Corps must take full advantage of these schools before it

finds itself deficient in space professionals with the requisite knowledge to support the operational forces.

The *Space Commission Report of January 2001* identified the need for more space education and training, noting the shortfall in growing space professionals.⁴⁰ The Department of Defense identified the NSSI as the single focal point for space education and training. The NSSI training and education was set forth to complement existing space education programs at Air University, the Naval Postgraduate School, and the Air Force Institute of Technology. The Marine Corps should continue with its NPS Space Operations Systems Officer program while at the same time negotiating with NSSI or U.S. Army Space and Missile Defense Command (SMDC)--the parent command of SOOQC—to implement a primary MOS producing space operations officer school.

The concept of the Marine Corps using another services' school to provide Marines with a primary MOS is nothing new. The Marine Corps currently uses the Army's artillery school at Fort Still, Oklahoma, and the Army's Military Police School at Fort Leonard Wood, Missouri. Utilizing another service for training would keep costs to a minimum while allowing seasoned MAGTF officers to take advantage of the joint school environment. A joint education will provide the Marine space operations officer with the necessary education and training in space operations required to support the MAGTF in joint/interagency operations.

Equipping

The third recommended way ahead is for the Marine Corps to procure equipment its space cadre would operate in support of operational force commanders. In December 1999, the U.S. Army stood up its 1st Space Battalion, which is currently under the 1st Space Brigade. The Battalion is organized into three companies and is responsible for the training and equipping of

the Space Support teams and ARSST-TS equipment to "provide worldwide space operations support to Army forces during operations as well as operations other-than-war."⁴¹ Since the Marine Corps in the current force structure is required to support two major theater operations in overlapping time frames, it is logical for the Marine Corps to procure three ARSST-TS and assign the required personnel to operate the three systems. The ARSST-TS system, with assigned personnel, could be designated as the Marine Expeditionary Space Support Team (MESST) and be assigned to Marine Forces Strategic Command (MARFORSTRAT). MARFORSTRAT serves as the U. S. Marine Corps service component to the Commander, United States Strategic Command (USSTRATCOM). MARFORSTRAT with the MESST under it would bring to USSTRATCOM a resident knowledge and access to Marine Corps capabilities that could concurrently support USSTRATCOM space mission and Marine operational forces. Additionally, when attached to Marine operational forces for a range of military options, the MESST would be the interface between the Marine Commander and USSTRATCOM, serve as the space expertise, and advocate for the Marine forces.

Conclusion

The Marine Corps is leaning forward and investing in the force enhancement capabilities that space assets provide. Space-based assets are global by nature and the Marine Corps, as an expeditionary force in readiness, takes advantage of the capabilities these assets provide. The Marine Corps understands that space-based assets provide its commanders with the ability to transmit and receive critical information in the planning and execution of missions at all levels of war (strategic, operational, and tactical). The Marine Corps, like the rest of the Department of Defense, is becoming more reliant on space systems. The availability of commercial and

government space-based technologies for the Marine Commander continues to expand, but so too does the complexity of these systems and how to best employ them. Providing the commander with a synergistic approach to plan and execute global precision navigation and targeting; global SATCOM; strategic and theater missile warning; global weather data; intelligence, surveillance, and reconnaissance (ISR); and combat search and rescue using space assets requires space operations experts. The Marine Corps must develop an expeditionary trained and equipped core of space professionals, beyond the status quo, who can provide the commander integrated space analysis, products, and expertise during the Marine Corps Planning Process (MCP), as well as, synchronize and provide existing and emerging space support products for the supported commanders.

The Marine Corps must make organizational changes and collaborate more with the other services to achieve this goal. The Marine Corps must make space operations a primary MOS where career progression, billet assignments, and education is tracked by Manpower Personnel, Headquarters Marine Corps. In partnership with the Army, NPS, or NSSI, establish and standardize a professional military education for space operations officers. In addition, once the Marine Corps has an educated field of space professionals it should partner with the Army and procure ARSST-TS. A highly trained core of space professional equipped with ARSST-TS ready to deploy and support an expeditionary Marine organization will be able to provide the commander with the colossal space force-enhancement tools that will multiply his combat power and integrate the Marine forces into joint operations.

In 2001, prior to the 9/11, attacks the Department of Defense began a transformation of its forces to a leaner more technologically advanced force; however, post 9/11 the U.S. military has expended a great amount of resources to fighting the Global War on Terrorism (GWOT).

The United States' potential adversaries have taken advantage of the U.S. being distracted with the GWOT. For example: China—successful use of direct ascent anti-satellite system; North Korea—successful test of nuclear weapon and continued research and development of long-range ballistic missiles; Iran—February 2008 test launch of missile that can some day carry a space payload; and Russia—research and development of advanced intercontinental ballistic missiles that can defeat the U.S. missile defense shield. Why should the above-mentioned military efforts of China, North Korea, Iran, and Russia concern the U.S.? The U.S. has become increasingly reliant on space-based assets for economic, informational, scientific, and military uses and its potential adversaries are looking for ways to gain an asymmetrical advantage over the U.S.

For over fifty years, the United States has led the world in space exploration and use and has “developed a solid civil, commercial, and national security space foundation”; however, space is no longer a sanctuary for the United States to enjoy alone.⁴² Other nations are quickly getting into the space race. Currently, 58 nations have satellites on orbit for military or economic purposes, 15 nations have indigenous space lift capability, and five international space-launch consortiums launch satellites for those countries that do not have the indigenous space lift capabilities.⁴³ As the world, and more importantly, the United States becomes more dependent on space technology to advance its gains, not only militarily, but also economically and politically, its reliance on space becomes a vulnerability to an enemy that seeks the advantage. *Marine Corps Strategy 21* states that the Marine Corps must be “the most ready when the Nation is the least ready.”⁴⁴ To make certain the axiom in *Marine Corps Strategy 21* holds true the Marine Corps must go beyond the space cadre.

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Typical ARSST composition

<i>Title</i>	<i>Number Personnel</i>	<i>MOS</i>	<i>Rank</i>
Space operations officer	1	40A	O4
Space operations officer	1	25C	O3
Intelligence analyst	1	96B	E6
SATCOM systems operator	1	31S	E5
Topographic analyst	1	81T	E5
Information systems operator-analyst	1	74B	E4

The ARSST is a deployable package with a minimal footprint. The equipment will fit entirely on a single high mobility multipurpose wheeled vehicle (HMMWV). The equipment package requires a 400-amp power bus and a single 787 shelter. A second HMMWV is used to transport the team and provide backup for the first. Additionally, the equipment set is C-130 air transportable. A trailer mounted tactical quiet generator and environmental control unit (ECU) provide necessary power, heating, and cooling. Computers are upgradeable and based on common hardware and software. The combination of computers and broadband communications equipment within the ARSST provides redundant high bandwidth communications and modular flexibility. The team has connectivity between the Space and Missile Defense Command Operations Center (SMDCOC) and remote sites with a triple redundant space-based communications suite. The ARSST has broadband commercial SATCOM communication capability with data rates sufficient for transmitting and receiving large imagery and data files and tactical high frequency radio communication, classified and unclassified. Computers and associated software are capable of imagery production and limited imagery assessment. They also provide a capability for two-dimensional display and mission route simulations; three-dimensional terrain models and fly-throughs; and red, gray, and blue area satellite coverage visualization. **Source: FM 3-14**

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